Attachment 1.
Phase 3b Buyoff Survey

Attachment 1. Phase 3b Buyoff Survey

Environmental Management - Grand Junction Office
MOAB UMTRA Project

Cell Floor Buyoff Form

Client: Department of Energy
Project: Moab UMTRA Project
Date: 05-25-2017

In signing this document, the signatory agrees that the lift is complete and meets both the project specifications and RAIP requirements.

Lift Area	Lift Area
Phase 3B	

Approver Name/Title	Signature	Sign Date
Craig Niemeyer/ CJ Operations/Site Mgr.		25MAY17
Mitch Hogan/ QA/QC Representative		05-25-2017
Cory J Vetere/ QA/QC Representative		05-25-2017
Comments		
574,623 ft².		

Attachment 1. Phase 3b Buyoff Survey (*continued*)

Cell Floor Buyoff Survey						
Lift Area Buyoff ID:			Phase 3B		Date:	5/25/2017
Point #	Northing	Easting	Surveyed Elevation	Design Elevation	Difference in feet	Difference in inches
3601_stk	6795994	2124702	4959.43	4959.355	0.1	0.9
3602_stk	6796000	2124751	4959.309	4959.307	0.0	0.0
3603_stk	6796006	2124801	4959.261	4959.258	0.0	0.0
3604_stk	6796011	2124851	4959.214	4959.21	0.0	0.0
3519_stk	6795961	2124856	4958.127	4958.06	0.1	0.8
3518_stk	6795956	2124807	4958.113	4958.108	0.0	0.1
3517_stk	6795950	2124757	4958.259	4958.157	0.1	1.2
3516_stk	6795945	2124707	4958.29	4958.205	0.1	1.0
3431_stk	6795895	2124713	4957.139	4957.055	0.1	1.0
3432_stk	6795901	2124763	4957.067	4957.007	0.1	0.7
3433_stk	6795906	2124812	4956.974	4956.958	0.0	0.2
3434_stk	6795912	2124862	4957.003	4956.91	0.1	1.1
3349_stk	6795862	2124868	4955.839	4955.76	0.1	0.9
3348_stk	6795856	2124818	4955.848	4955.808	0.0	0.5
3347_stk	6795851	2124768	4955.937	4955.857	0.1	1.0
3346_stk	6795845	2124718	4956.057	4955.905	0.2	1.8
3261_stk	6795796	2124724	4954.875	4954.755	0.1	1.4
3262_stk	6795801	2124774	4954.779	4954.707	0.1	0.9
3263_stk	6795807	2124823	4954.747	4954.658	0.1	1.1
3264_stk	6795812	2124873	4954.638	4954.61	0.0	0.3
3179_stk	6795763	2124879	4953.482	4953.46	0.0	0.3
3178_stk	6795757	2124829	4953.536	4953.508	0.0	0.3
3177_stk	6795752	2124779	4953.625	4953.557	0.1	0.8
3176_stk	6795746	2124730	4953.701	4953.605	0.1	1.2
3091_stk	6795696	2124735	4952.556	4952.455	0.1	1.2
3092_stk	6795702	2124785	4952.579	4952.407	0.2	2.1
3093_stk	6795707	2124835	4952.435	4952.358	0.1	0.9
3094_stk	6795713	2124884	4952.4	4952.31	0.1	1.1
3009_stk	6795663	2124890	4951.253	4951.16	0.1	1.1
3008_stk	6795658	2124840	4951.262	4951.208	0.1	0.6
3007_stk	6795652	2124790	4951.417	4951.257	0.2	1.9
3006_stk	6795647	2124741	4951.46	4951.305	0.2	1.9
2921_stk	6795597	2124746	4950.281	4950.155	0.1	1.5
2922_stk	6795602	2124796	4950.23	4950.107	0.1	1.5
2923_stk	6795608	2124846	4950.237	4950.058	0.2	2.1
2924_stk	6795614	2124895	4950.056	4950.01	0.0	0.6
2839_stk	6795564	2124901	4948.97	4948.86	0.1	1.3
2838_stk	6795558	2124851	4948.992	4948.908	0.1	1.0
2837_stk	6795553	2124802	4949.088	4948.957	0.1	1.6
2836_stk	6795547	2124752	4949.128	4949.005	0.1	1.5
2751_stk	6795497	2124757	4947.989	4947.855	0.1	1.6
2752_stk	6795503	2124807	4947.911	4947.807	0.1	1.2
2753_stk	6795509	2124857	4947.86	4947.758	0.1	1.2
2754_stk	6795514	2124907	4947.812	4947.71	0.1	1.2
2669_stk	6795464	2124912	4946.605	4946.56	0.0	0.5
2668_stk	6795459	2124862	4946.673	4946.608	0.1	0.8
2667_stk	6795453	2124813	4946.776	4946.657	0.1	1.4

Attachment 1. Phase 3b Buyoff Survey (*continued*)

Point #	Northing	Easting	Surveyed Elevation	Design Elevation	Difference in feet	Difference in inches
2666_stk	6795448	2124763	4946.805	4946.705	0.1	1.2
2581_stk	6795398	2124769	4945.697	4945.555	0.1	1.7
2582_stk	6795404	2124818	4945.638	4945.507	0.1	1.6
2583_stk	6795409	2124868	4945.533	4945.458	0.1	0.9
2584_stk	6795415	2124918	4945.483	4945.41	0.1	0.9
2499_stk	6795365	2124923	4944.342	4944.26	0.1	1.0
2498_stk	6795360	2124874	4944.35	4944.308	0.0	0.5
2497_stk	6795354	2124824	4944.521	4944.357	0.2	2.0
2496_stk	6795348	2124774	4944.497	4944.405	0.1	1.1
2411_stk	6795299	2124780	4943.359	4943.255	0.1	1.2
2412_stk	6795304	2124830	4943.33	4943.207	0.1	1.5
2413_stk	6795310	2124879	4943.257	4943.158	0.1	1.2
2414_stk	6795316	2124929	4943.193	4943.11	0.1	1.0
2329_stk	6795266	2124934	4942.071	4941.96	0.1	1.3
2328_stk	6795260	2124885	4942.083	4942.008	0.1	0.9
2327_stk	6795255	2124835	4942.116	4942.057	0.1	0.7
2242_stk	6795205	2124841	4940.978	4940.907	0.1	0.9
2243_stk2	6795210	2124890	4940.969	4940.858	0.1	1.3
2244_stk	6795216	2124940	4940.832	4940.81	0.0	0.3
2159_stk	6795166	2124946	4939.755	4939.66	0.1	1.1
2158_stk	6795161	2124896	4939.715	4939.708	0.0	0.1
2157_stk	6795155	2124846	4939.81	4939.757	0.1	0.6
2072_stk	6795106	2124852	4938.668	4938.607	0.1	0.7
2073_stk	6795111	2124902	4938.58	4938.558	0.0	0.3
2074_stk	6795117	2124951	4938.616	4938.51	0.1	1.3
1234_stk	6795038	2124905	4937.023	4936.922	0.1	1.2
1236_stk	6795049	2125005	4936.877	4936.829	0.0	0.6
1243_stk	6794999	2125010	4935.718	4935.679	0.0	0.5
1252_stk	6794950	2125016	4934.594	4934.529	0.1	0.8
1309_stk	6794547	2125012	4925.431	4925.375	0.1	0.7
1310_stk	6794552	2125061	4925.352	4925.329	0.0	0.3
1311_stk	6794558	2125111	4925.286	4925.282	0.0	0.0
1302_stk	6794608	2125105	4926.443	4926.432	0.0	0.1
1303_stk	6794602	2125056	4926.545	4926.479	0.1	0.8
1304_stk	6794596	2125006	4926.597	4926.525	0.1	0.9
1294_stk	6794640	2124951	4927.728	4927.722	0.0	0.1
1280_stk	6794745	2124989	4929.992	4929.975	0.0	0.2
1295_stk	6794646	2125000	4927.683	4927.675	0.0	0.1
1987_stk	6795056	2124858	4937.491	4937.457	0.0	0.4
1990_stk	6795073	2125007	4937.365	4937.312	0.1	0.6
1991_stk	6795078	2125056	4937.267	4937.264	0.0	0.0
1992_stk	6795084	2125106	4937.271	4937.215	0.1	0.7
1993_stk	6795089	2125156	4937.211	4937.167	0.0	0.5
1908_stk	6795040	2125161	4936.022	4936.017	0.0	0.1
1907_stk	6795034	2125111	4936.07	4936.065	0.0	0.1
1906_stk	6795029	2125062	4936.2	4936.114	0.1	1.0
1905_stk	6795023	2125012	4936.215	4936.162	0.1	0.6
1820_stk	6794973	2125018	4935.099	4935.012	0.1	1.0
1821_stk	6794979	2125067	4935.014	4934.964	0.1	0.6
1822_stk	6794984	2125117	4934.952	4934.915	0.0	0.4
1823_stk	6794990	2125167	4934.912	4934.867	0.0	0.5
1738_stk	6794940	2125172	4933.734	4933.717	0.0	0.2
1737_stk	6794935	2125123	4933.779	4933.765	0.0	0.2
1736_stk	6794929	2125073	4933.897	4933.814	0.1	1.0
1651_stk	6794879	2125078	4932.708	4932.664	0.0	0.5
1652_stk	6794885	2125128	4932.679	4932.615	0.1	0.8
1653_stk	6794891	2125178	4932.614	4932.567	0.0	0.6
1568_stk	6794841	2125183	4931.52	4931.417	0.1	1.2
1567_stk	6794835	2125134	4931.559	4931.465	0.1	1.1
1566_stk	6794830	2125084	4931.591	4931.514	0.1	0.9
1565_stk	6794824	2125034	4931.646	4931.562	0.1	1.0
1480_stk	6794774	2125040	4930.502	4930.412	0.1	1.1
1481_stk	6794780	2125090	4930.45	4930.364	0.1	1.0
1482_stk	6794786	2125139	4930.474	4930.315	0.2	1.9

Attachment 1. Phase 3b Buyoff Survey (*continued*)

Point #	Northing	Easting	Surveyed Elevation	Design Elevation	Difference in feet	Difference in inches
1483_stk	6794791	2125189	4930.315	4930.267	0.0	0.6
1398_stk	6794742	2125195	4929.189	4929.117	0.1	0.9
1397_stk	6794736	2125145	4929.327	4929.165	0.2	1.9
1396_stk	6794730	2125095	4929.287	4929.214	0.1	0.9
1395_stk	6794725	2125046	4929.354	4929.262	0.1	1.1
1312_stk	6794686	2125151	4928.119	4928.015	0.1	1.2
1313_stk	6794692	2125200	4927.998	4927.967	0.0	0.4
1228_stk	6794642	2125206	4926.847	4926.817	0.0	0.4
1227_stk	6794637	2125156	4926.909	4926.865	0.0	0.5
1226_stk	6794631	2125106	4926.979	4926.914	0.1	0.8
1225_stk	6794625	2125057	4926.996	4926.962	0.0	0.4
1224_stk	6794620	2125007	4927.074	4927.01	0.1	0.8
1139_stk	6794570	2125013	4925.954	4925.9	0.1	0.6
1140_stk	6794576	2125062	4925.901	4925.864	0.0	0.4
1141_stk	6794581	2125112	4925.866	4925.829	0.0	0.4
1142_stk	6794587	2125162	4925.851	4925.794	0.1	0.7
1143_stk	6794593	2125211	4925.803	4925.759	0.0	0.5
3769_stk	6796083	2124591	4961.792	4961.751	0.0	0.5
3854_stk	6796132	2124586	4963.089	4963.083	0.0	0.1
3939_stk	6796164	2124576	4964.022	4963.981	0.0	0.5
3940_stk	6796169	2124625	4964.102	4963.978	0.1	1.5
3855_stk	6796138	2124635	4963.079	4963.051	0.0	0.3
3770_stk	6796088	2124641	4961.726	4961.703	0.0	0.3
3686_stk	6796044	2124696	4960.569	4960.505	0.1	0.8
3771_stk	6796094	2124691	4961.709	4961.655	0.1	0.6
3856_stk	6796143	2124685	4963.041	4963.022	0.0	0.2
3941_stk	6796175	2124675	4963.999	4963.975	0.0	0.3
3942_stk	6796181	2124725	4964.027	4963.971	0.1	0.7
3943_stk	6796187	2124774	4963.969	4963.968	0.0	0.0
3944_stk	6796193	2124824	4963.97	4963.964	0.0	0.1
3945_stk	6796198	2124874	4964.02	4963.96	0.1	0.7
3946_stk	6796204	2124923	4964.002	4963.956	0.0	0.6
3947_stk	6796210	2124973	4964.006	4963.952	0.1	0.6
3862_stk	6796177	2124983	4962.782	4962.776	0.0	0.1
3861_stk	6796171	2124933	4962.827	4962.821	0.0	0.1
3860_stk	6796166	2124884	4962.906	4962.861	0.0	0.5
3859_stk	6796160	2124834	4962.946	4962.91	0.0	0.4
3858_stk	6796155	2124784	4962.947	4962.945	0.0	0.0
3857_stk	6796149	2124735	4963.008	4962.981	0.0	0.3
3772_stk	6796099	2124740	4961.613	4961.607	0.0	0.1
3773_stk	6796105	2124790	4961.589	4961.558	0.0	0.4
3774_stk	6796110	2124840	4961.645	4961.51	0.1	1.6
3775_stk	6796116	2124889	4961.509	4961.462	0.0	0.6
3776_stk	6796122	2124939	4961.481	4961.414	0.1	0.8
3777_stk	6796127	2124989	4961.446	4961.365	0.1	1.0
3692_stk	6796077	2124994	4960.223	4960.215	0.0	0.1
3691_stk	6796072	2124945	4960.293	4960.264	0.0	0.3
3690_stk	6796066	2124895	4960.342	4960.312	0.0	0.4
3689_stk	6796061	2124845	4960.485	4960.36	0.1	1.5
3688_stk	6796055	2124795	4960.47	4960.408	0.1	0.7
3687_stk	6796050	2124746	4960.493	4960.457	0.0	0.4
3605_stk	6796017	2124900	4959.181	4959.162	0.0	0.2
3606_stk	6796022	2124950	4959.131	4959.114	0.0	0.2
3607_stk	6796028	2125000	4959.117	4959.065	0.1	0.6

Attachment 1. Phase 3b Buyoff Survey (*continued*)

Point #	Northing	Easting	Surveyed Elevation	Design Elevation	Difference in feet	Difference in inches
3522_stk	6795978	2125005	4957.931	4957.915	0.0	0.2
3521_stk	6795973	2124956	4957.986	4957.964	0.0	0.3
3520_stk	6795967	2124906	4958.103	4958.012	0.1	1.1
3435_stk	6795917	2124912	4956.928	4956.862	0.1	0.8
3436_stk	6795923	2124961	4956.852	4956.814	0.0	0.5
3437_stk	6795928	2125011	4956.854	4956.765	0.1	1.1
3352_stk	6795879	2125016	4955.711	4955.615	0.1	1.2
3351_stk	6795873	2124967	4955.714	4955.664	0.1	0.6
3350_stk	6795868	2124917	4955.773	4955.712	0.1	0.7
3266_stk	6795824	2124972	4954.536	4954.514	0.0	0.3
3267_stk	6795829	2125022	4954.51	4954.465	0.0	0.5
3182_stk	6795779	2125028	4953.35	4953.315	0.0	0.4
3181_stk	6795774	2124978	4953.424	4953.364	0.1	0.7
3180_stk	6795768	2124928	4953.419	4953.412	0.0	0.1
3095_stk	6795719	2124934	4952.33	4952.262	0.1	0.8
3096_stk	6795724	2124984	4952.221	4952.214	0.0	0.1
3097_stk	6795730	2125033	4952.194	4952.165	0.0	0.3
3012_stk	6795680	2125039	4951.02	4951.015	0.0	0.1
3011_stk	6795674	2124989	4951.124	4951.064	0.1	0.7
3010_stk	6795669	2124939	4951.182	4951.112	0.1	0.8
2925_stk	6795619	2124945	4949.963	4949.962	0.0	0.0
2926_stk	6795625	2124995	4949.964	4949.914	0.1	0.6
2927_stk	6795630	2125044	4949.936	4949.865	0.1	0.9
2842_stk	6795581	2125050	4948.773	4948.715	0.1	0.7
2841_stk	6795575	2125000	4948.79	4948.764	0.0	0.3
2840_stk	6795570	2124951	4948.868	4948.812	0.1	0.7
2755_stk	6795520	2124956	4947.709	4947.662	0.0	0.6
2756_stk	6795525	2125006	4947.687	4947.614	0.1	0.9
2757_stk	6795531	2125056	4947.651	4947.565	0.1	1.0
2672_stk	6795481	2125061	4946.514	4946.415	0.1	1.2
2671_stk	6795476	2125012	4946.512	4946.464	0.0	0.6
2670_stk	6795470	2124962	4946.545	4946.512	0.0	0.4
2585_stk	6795420	2124967	4945.38	4945.362	0.0	0.2
2586_stk	6795426	2125017	4945.345	4945.314	0.0	0.4
2587_stk	6795432	2125067	4945.279	4945.265	0.0	0.2
2588_stk	6795437	2125116	4945.32	4945.217	0.1	1.2
2503_stk	6795388	2125122	4944.194	4944.067	0.1	1.5
2502_stk	6795382	2125072	4944.16	4944.115	0.0	0.5
2501_stk	6795376	2125023	4944.18	4944.164	0.0	0.2
2500_stk	6795371	2124973	4944.219	4944.212	0.0	0.1
2415_stk	6795321	2124979	4943.064	4943.062	0.0	0.0
2416_stk	6795327	2125028	4943.091	4943.014	0.1	0.9
2417_stk	6795332	2125078	4942.982	4942.965	0.0	0.2
2418_stk	6795338	2125128	4942.981	4942.917	0.1	0.8
2333_stk	6795288	2125133	4941.843	4941.767	0.1	0.9
2332_stk	6795283	2125084	4941.837	4941.815	0.0	0.3
2331_stk	6795277	2125034	4941.941	4941.864	0.1	0.9
2330_stk	6795271	2124984	4941.964	4941.912	0.1	0.6
2245_stk	6795222	2124990	4940.811	4940.762	0.0	0.6
2246_stk	6795227	2125039	4940.749	4940.714	0.0	0.4
2247_stk	6795233	2125089	4940.691	4940.665	0.0	0.3
2248_stk	6795238	2125139	4940.684	4940.617	0.1	0.8
2163_stk	6795189	2125144	4939.494	4939.467	0.0	0.3
2162_stk	6795183	2125095	4939.523	4939.515	0.0	0.1
2161_stk	6795178	2125045	4939.604	4939.564	0.0	0.5

Attachment 1. Phase 3b Buyoff Survey (*continued*)

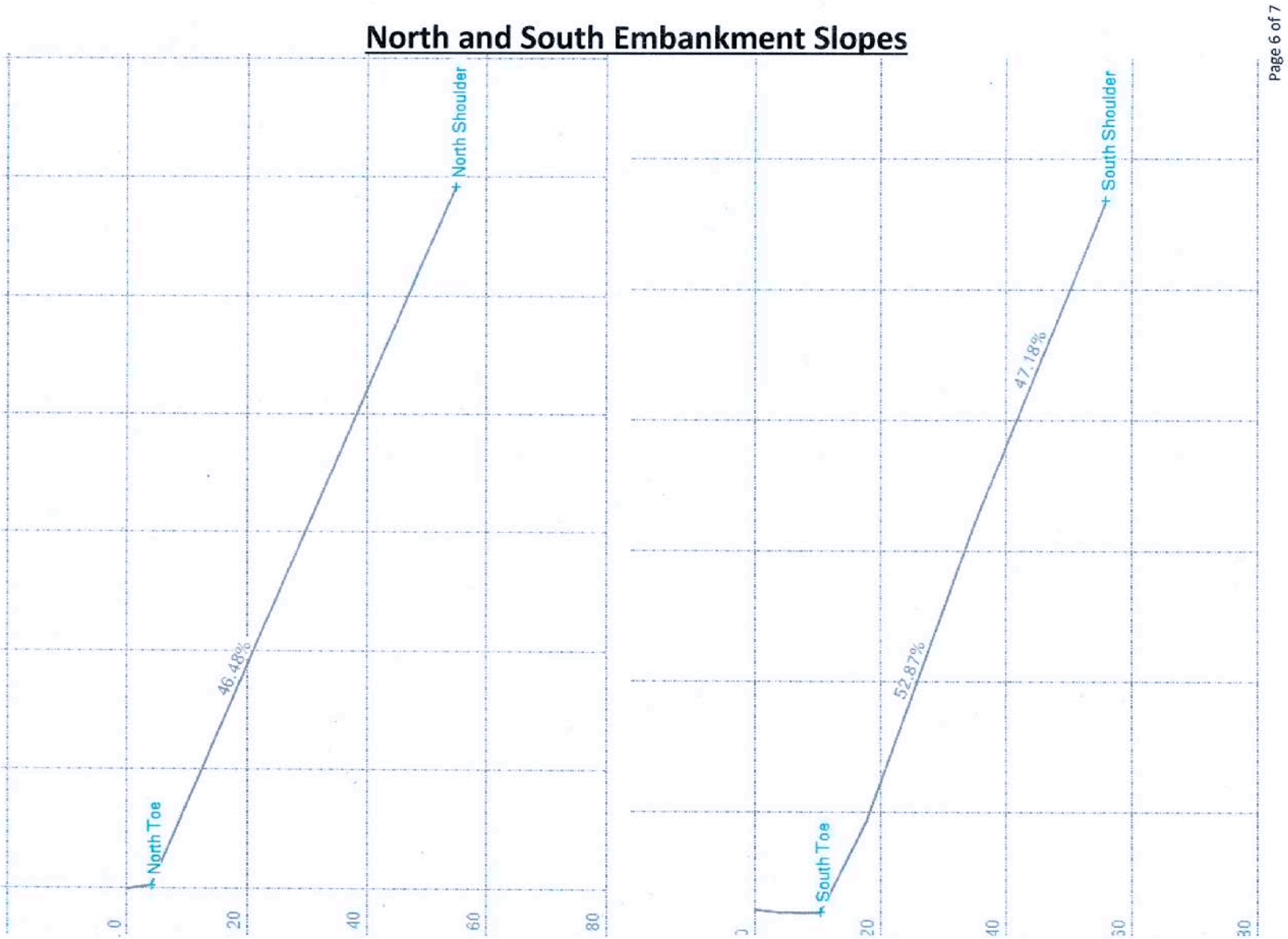
Point #	Northing	Easting	Surveyed Elevation	Design Elevation	Difference in feet	Difference in inches
2160_stk	6795172	2124995	4939.667	4939.612	0.1	0.7
2075_stk	6795122	2125001	4938.512	4938.462	0.0	0.6
2076_stk	6795128	2125051	4938.456	4938.414	0.0	0.5
2077_stk	6795133	2125100	4938.387	4938.365	0.0	0.3
2078_stk	6795139	2125150	4938.373	4938.317	0.1	0.7
1988_stk	6795062	2124907	4937.424	4937.408	0.0	0.2
1989_stk	6795067	2124957	4937.386	4937.36	0.0	0.3
1904_stk	6795017	2124962	4936.305	4936.21	0.1	1.1
1903_stk	6795012	2124913	4936.274	4936.258	0.0	0.2
1818_stk	6794962	2124918	4935.173	4935.108	0.1	0.8
1819_stk	6794968	2124968	4935.147	4935.06	0.1	1.0
1735_stk	6794924	2125023	4933.908	4933.862	0.0	0.6
1734_stk	6794918	2124974	4933.996	4933.91	0.1	1.0
1733_stk	6794912	2124924	4934.036	4933.958	0.1	0.9
1648_stk	6794863	2124929	4932.852	4932.808	0.0	0.5
1649_stk2	6794868	2124979	4932.822	4932.76	0.1	0.7
1650_stk	6794874	2125029	4932.75	4932.712	0.0	0.5
1564_stk	6794819	2124985	4931.634	4931.61	0.0	0.3
1563_stk	6794813	2124935	4931.691	4931.658	0.0	0.4
1478_stk	6794763	2124941	4930.633	4930.508	0.1	1.5
1479_stk	6794769	2124990	4930.524	4930.46	0.1	0.8
1394_stk	6794719	2124996	4929.338	4929.31	0.0	0.3
1393_stk	6794714	2124946	4929.394	4929.358	0.0	0.4
1308_stk	6794664	2124952	4928.238	4928.208	0.0	0.4
1223_stk	6794614	2124957	4927.086	4927.058	0.0	0.3

Comments: QC performed a visual inspection of the final surface with satisfactory results. Visual inspection notes: The area was free of humping and defects. The layer uniform thickness was satisfactory see above survey results for layer thickness.

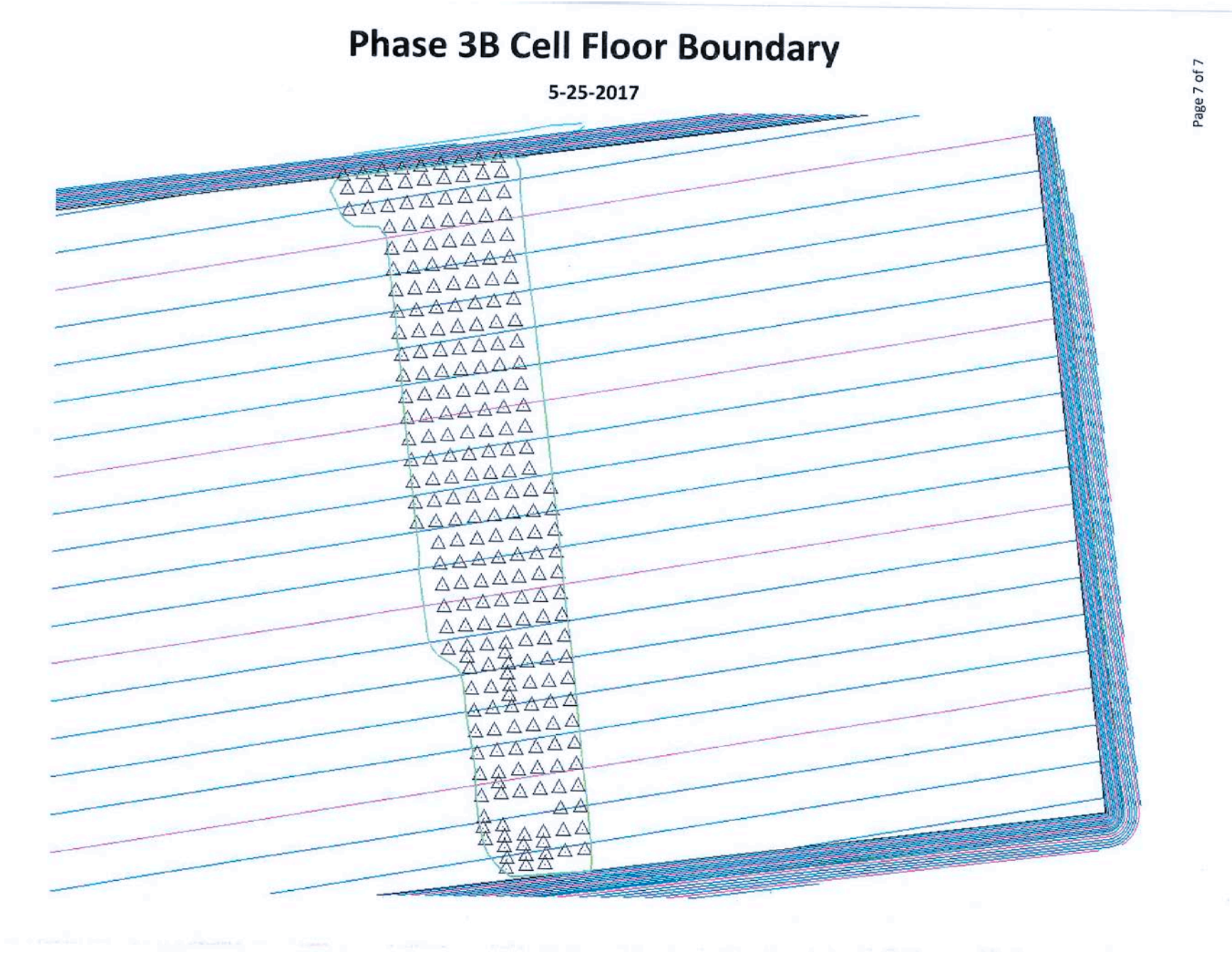
Approval Date: 5/25/2017 **Total Square Feet:** 574,623

North West Corner: 6796163 N. 2124575 E.

QC Signature:Mitch Hogan/ Mitch Hogan 05.25.2017 Reviewed By:Cory J Vetere/ Cory J Vetere 05-25-2017


North and South Embankment Slopes
North Shoulder
North Toe
46.48%
0
20
40
60
80
South Shoulder
South Toe
47.18%
52.87%
20
40
30
30

Attachment 1. Phase 3b Buyoff Survey (*continued*)



Attachment 2.
Lift Approval Procedure
Debris Processing and Disposal Procedure

Attachment 2. Lift Approval Procedure

DOE–EM/GJRAC1803

Office of Environmental Management – Grand Junction

UMTRA Project

Moab UMTRA Project
Lift Approval Procedure

Revision 8

January 2017

U.S. Department of Energy

Office of Environmental Management

Prepared by the Remedial Action Contractor under contract number DE-DT0011049
for the U.S. Department of Energy Office of Environmental Management, Grand Junction, Colorado.

DOE-EM/GJRAC1803

Moab UMTRA Project
Lift Approval Procedure

Revision 8

January 2017

Prepared by the Remedial Action Contractor under contract number DE-DT0011049
for the U.S. Department of Energy Office of Environmental Management, Grand Junction, Colorado.

DOE-EM/GJRAC1803

Moab UMTRA Project
Lift Approval Procedure

Revision 8

Review and Approval

Kathy Turvy
RAC Quality Assurance Manager — Date: 1/24/2017

Mitch Hogan
RAC Quality Assurance Representative — Date: 01.24.2017

Mike McDonald
RAC Environmental, Safety, Health, and Quality Manager — Date: 1-25-17

Attachment 2. Lift Approval Procedure (*continued*)

Revision History

Revision	Date	Reason for Revision
0	April 16, 2009	Initial issue.
1	April 23, 2009	Revision update includes correction of lift approval percentage.
2	December 2009	Revision updates include machine parameter changes, compactor information, cold weather placement, and surveying methods.
3	November 2010	Revision updates include updated forms, reference to testing in accordance with DOE-EM/GJRAC1783, horizontal lift compaction requirements, and survey documentation requirements.
4	July 2011	Revision updates include new verbiage to section 3.2.4 Lift Survey.
5	August 2012	Revision updates include adding the correct machine weights and updated forms.
6	January 2013	Revision updates includes new verbiage and deletion of Source Documentation section.
7	June 2014	Revision update includes new content for clarification.
8	January 2017	Updated lift Approval to allow 24" loose lifts and increased the number of passes required.

Contents

Attachments

Attachment 2. Lift Approval Procedure (*continued*)

1.0 Purpose and Scope

1.1 Purpose

The purpose of this procedure is to provide a consistent and practical method of compacting residual radioactive material (RRM) on the Moab Uranium Mill Tailings Remedial Action (UMTRA) Project using a machine equipped with a computer-aided earthmoving system (computer system) and to provide methods for approving RRM lifts.

1.2 Scope

This procedure applies to RRM lifts using a machine equipped with a computer system and the approval of RRM lifts.

2.0 General

2.1 Definitions

Computer-aided earthmoving system (computer system) – Machine guidance system that delivers real-time productivity information to machine operators on an in-cab display using satellite navigation technology, machine-mounted components, a radio network, and office-management software.

Layer of snow – Blanket of snow that covers working lift areas without any voids in the snow.

Lift Area – Area of the embankment identified for material placement.

Lift Identification – Discrete number that consists of:

- Moab UMTRA Project (e.g., U for UMTRA Project cell).
- Work Element (e.g., W for RRM placement, I for interim cover placement, R for radon barrier placement, B for biointrusion placement, F for frost protection placement, C for cap rock placement, E for embankment placement, CF for cell floor).
- Lift Area – (e.g., A1, B1, C1) year, month, and day (e.g., UWA1090117, UIA1090117, URA1090117, UBA1090117, UFA1090117, UCA1090117).
- Number of lifts tested and approved for a specific lift area on the same day (e.g., 1st lift -00, 2nd lift -01).

Example: U for Moab UMTRA Project, W for RRM lift, A1 for lift area, 121206 date or day lift was first tested, and -00 for 1st lift tested that day (e.g., UWA1121206-00).

NOTE: The day the lift area is first tested will be the date used for lift identification.

Machine – Heavy equipment that is greater than or equal to 56,669 pounds (lb) in weight.

Machine pass – Movement of a machine across an area of the lift in any direction that meets compaction criteria calculated by an algorithm in the computer system.
Movement of the machine from one side of the lift to the opposite side of the lift, which meets compaction criteria calculated by an algorithm in the computer system, constitutes one pass; the return trip from the opposite side of the lift, which also meets compaction criteria calculated by an algorithm in the compactor's system, constitutes a second pass.

Wheel pass – Movement of the machine rear or front axle/wheels across an area of the lift that meets compaction criteria calculated by an algorithm in the compactor's system. The computer system reports one wheel pass for each end of the machine (i.e., two wheel passes equals one machine pass).

2.2 Responsibilities

2.2.1 Quality Assurance Manager

The Quality Assurance (QA) Manager is responsible for:

- Implementing and directing Quality Control (QC) activities contained within this procedure.
- Identifying QC problems.
- Initiating, recommending, and/or providing QC solutions.

2.2.2 QA/QC Representative

The QA/QC Representative or designee is responsible for the proper implementation of this procedure and for approving lifts in accordance with this procedure.

2.2.3 Operations/Site Manager

The Operations/Site Manager or designee is responsible for issuing directives to equipment operators.

2.2.4 Equipment Operators

Equipment operators are responsible for compacting lifts with the compaction machine in accordance with this procedure.

2.2.5 All Personnel

When involved in compacting RRM lifts using the compaction machine, all employees are responsible for identifying any safety hazards and complying with the applicable Radiological Work Permits and Integrated Work Plans.

2.3 Precautions and Limitations

2.3.1 Pause Work

Work shall be immediately terminated by any personnel who feel the activity in progress is unsafe and/or may create an unsafe condition. Work will be resumed when the condition is corrected.

2.3.2 Safety Protocols

All personnel shall remain clear of any operating equipment and maintain good communication with the equipment operator.

Personnel observing compaction using the compaction machine shall always be in visual view of the operator and shall be in front of the machine and never behind the machine working area while machine is in operation.

2.3.3 Training and Procedures

All personnel using the Troxler Nuclear Density Gauge shall attend 8 hours of Nuclear Moisture/Density Gauge training or working in direct supervision of a trained operator and shall perform all testing in accordance with Project procedures.

2.4 Records

All documentation created as a result of compliance with this procedure is considered a Project record and will be managed in accordance with the *Moab UMTRA Project Records Management Manual* (DOE-EM/GJ1545), which follows DOE orders, policies, and regulations for retention and maintenance of records.

The compactor screen printout and the calculations of the exported terrain data shall be attached to the Lift Approval Form (QC-F-001) (see Attachment 1).

Following QA/QC approval of the QC documents, the original documentation shall be transmitted to Records.

3.0 Requirements and Guidance

3.1 Compliance

3.1.1 Lift Identification

Each lift shall be given a discrete lift identification number. The lift identification number shall be used to identify all documentation for that lift.

3.1.2 RRM Disposal

No RRM shall be disposed of on a lift until the previous lift is approved, with the exception of management of stockpile material

3.1.3 Lift Thickness

Lift thickness shall not exceed an average uncompacted thickness of 12 inches for 1 foot lifts and 24 inches for 2 foot lifts.

3.1.4 Debris

In accordance with this procedure, debris placement shall be in a single layer, shall be distributed across the lift, and shall comply with the debris size requirements found in Addendum E, "Remedial Action Inspection Plan," of the *Moab UMTRA Project Remedial Action Plan* (DOE-EM/GJ1547).

3.1.5 Machine Properties

The machine properties (see Attachments 2, 3, 4, and 5) under the machine parameters tab for the machines shall be:

- Number of levels (the number of machine passes) shall be set at:
  - For 12 inch lifts - Four machine passes are required for machines weighing between 56,669 and 84,850 lb and three machine passes are required for 825H Caterpillar compactors and machines weighing greater than or equal to 84,850 lb.
  - For 24 inch lifts - Eight machine passes are required for machines weighing between 56,669 and 84,850 lb and six machine passes are required for 825H Caterpillar compactors and machines weighing greater than or equal to 84,850 lb.
- Thick lift thresholds shall be set at:
  For lift heights set at 12 inches the thick lift threshold shall be set at 2 feet.
  For lift heights set at 24 inches the thick lift threshold shall be set at 3 feet.

3.2 Procedure

3.2.1 Moisture Testing

When performing moisture testing, a representative sample shall be obtained from material placed that day. The QC Representative (or qualified personnel) shall perform a moisture test in accordance with applicable ASTM International (ASTM) standards for each day that material is placed. Test results shall be documented on the Field Density Test Form (QC-F-002) (see Attachment 6).

3.2.2 Debris Inspection

The QC Representative (or qualified personnel) shall inspect the debris once it is spread out across the lift. The debris shall be spread out uniformly across the lift in a manner that minimizes void spaces and shall not exceed debris size requirements. The debris/RRM ratio shall not exceed 50 percent debris by volume. The debris inspection shall be documented on the Lift Approval Form.

3.2.3 Visual Inspection

The QC Representative (or qualified personnel) shall visually inspect the lift areas for frozen material, frost, and snow before placement of RRM. No soil that is frozen, has frost, or is under a layer of snow shall be approved for placement. The inspection shall be documented on the Lift Approval Form under the comment section.

3.2.4 Lift Surveys

Each lift shall be surveyed using a high-accuracy, hand-held global positioning system (GPS) or computer system. When determining the lift thickness of a lift area less than 3,000 square feet, one survey point should be performed for every 15 feet. When determining the lift thickness of a lift area greater than or equal to 3,000 square feet, the survey for each lift shall have a minimum of 10 points. The lift thickness will be determined by comparing the current lift elevations to the previous lift elevations located on the same northing and easting locations.

When calculating the uncompacted lift thickness, no survey point shall be greater than 1.3 feet, as long as the average uncompacted thickness is less than or equal to 1 foot and 2.3 feet as long as the average uncompacted thickness is less than or equal to 2 foot. The lift shall be placed in a manner that will result in a relative uniform thickness. Surveys shall be documented on the appropriate form and attached to the Lift Approval Form.

3.2.5

3.2.6 Computer System Terrain Data

Each lift shall be compacted by the minimum number of required machine passes depending on weight, type of machine used and lift thickness. To ensure the lift area meets the minimum required machine passes, print the compaction screen, identify the lift area (draw lift boundary), and export the terrain data for the lift using the computer system.

3.2.7 Requirements for Lift Approval

Lifts that meet the following requirements shall be approved.

- Seventy percent of the pixels have greater than or equal to three or four machine passes for 1 foot lifts or six or eight machine passes for 2 foot lifts depending on weight of machine (green pixels) when placing material on slopes.
- Eighty percent of the pixels have greater than or equal to three or four machine passes for 1 foot lifts or six or eight machine passes for 2 foot lifts depending on weight of machine (green pixels) when placing material on approximately horizontal lifts.
- The average lift thickness is less than or equal to 12 inches for a 1 foot lift or 24 inches for a 2 foot lift with no white pixels on the compactor screen printout.
- The compactor screen print out shows uniform compaction over the entire lift area.

3.2.8 Reworking of Lifts

Lifts that do not meet the Moab UMTRA Project requirements shall be reworked (e.g., adding additional compaction, cutting the lift, adding more moisture); rework performed shall be documented.

3.2.9 Troxler Gauge Testing

The QC Representative (or qualified personnel) shall perform in-place density tests every 6 months in accordance with ASTM Standard D6938, "Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth),"and ASTM D1556, "Standard Test Method for Density and Unit Wight of Soil in Place by the Sand-Cone Method," to verify the computer system is working correctly. If the computer system is not used to verify compaction and the lift thickness, then the lift shall be tested in accordance with *Moab UMTRA Project Moisture/Density Testing Procedure* (DOE-EM/GJRAC1783). The testing frequency, inspections, and required reporting shall comply with the RAIP and surveying shall be performed using a hand-held GPS or a level survey.

4.0 References

ASTM (ASTM International) Standard D6938, "Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)."

ASTM (ASTM International) Standard D1556, "Standard Test Method for Density and Unit Wight of Soil in Place by the Sand-Cone Method."

DOE (U.S. Department of Energy) *Moab UMTRA Project Moisture/Density Testing Procedure* (DOE-EM/GJRAC1783).

DOE (U.S. Department of Energy) *Moab UMTRA Project Records Management Manual* (DOE-EM/GJ1545).

DOE (U.S. Department of Energy) *Moab UMTRA Project Remedial Action Plan* (DOE-EM/GJ1547).

Attachment 1.
Lift Approval Form (QC-F-001)

Attachment 2. Lift Approval Procedure (*continued*)

Attachment 1. Lift Approval Form (QC-F-001)

LIFT APPROVAL FORM

PROJECT: Moab UMTRA OTHER

NW CORNER DATE:

	P 1 EW: X = NS: X = P 2 EW: X = NS: X = P 3 EW: X = NS: X = P 4 EW: X = NS: X = P 5 EW: X = NS: X = Page 2 attached: Y N

IDENTIFY LOTS ABOVE

LIFT ID: NW CORNER:

Uncompacted Thickness: Compacted Thickness: Debris Insp. By: Date: Time:

NW CORNER of debris placement: EW Dimension NS Dimension

Lift Area (ft²): Lift Volume (yd³):

Commets:

Attached Forms: Grid Slope _____ Compaction Macro _____ Print Screen _____ Moisture/ Density _____

KEYING IN NOTES: N E S W MOISTURE/ DENSITY TESTS ID # (S):

LIFT APPROVED BY: DATE: TIME:

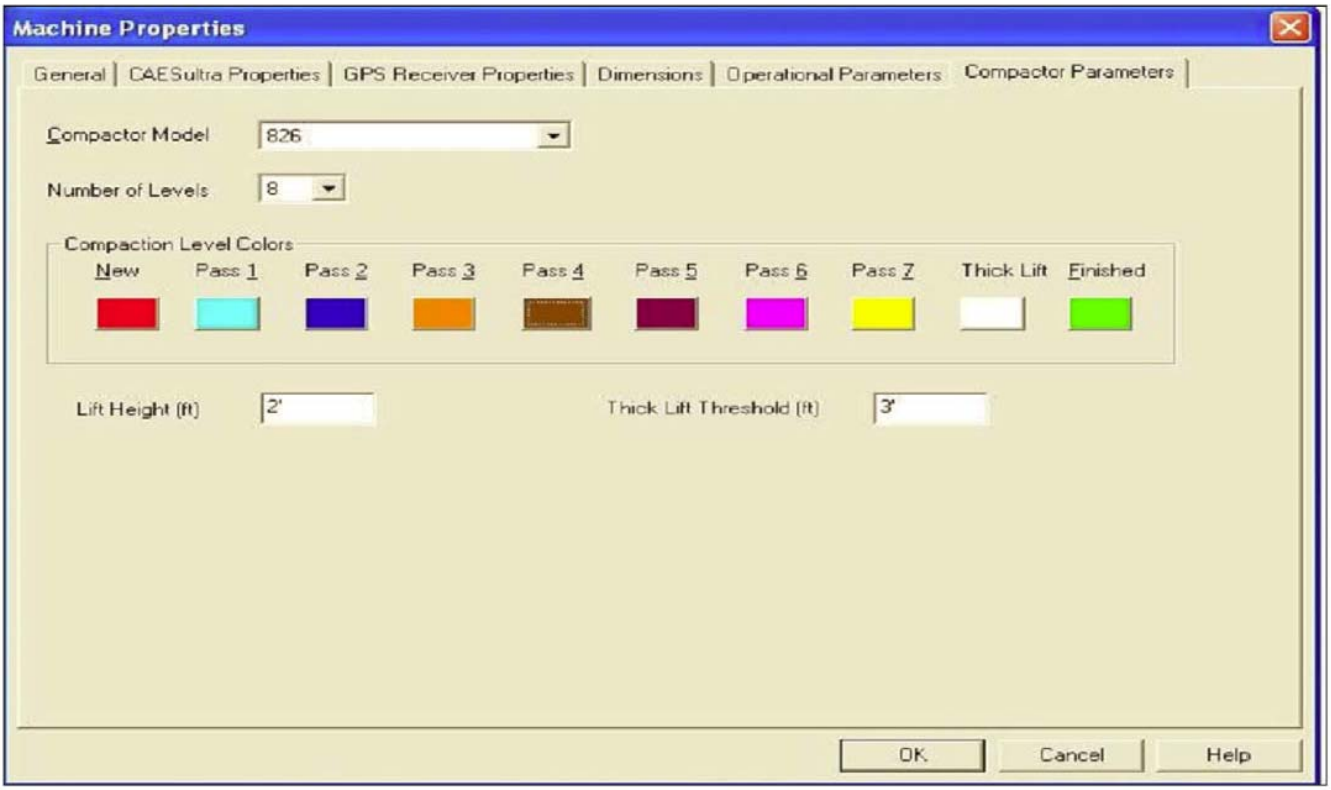
QA/QC APPROVAL DATE

Density Testing
DOE-EM/GJRAC1783
Rev. 1

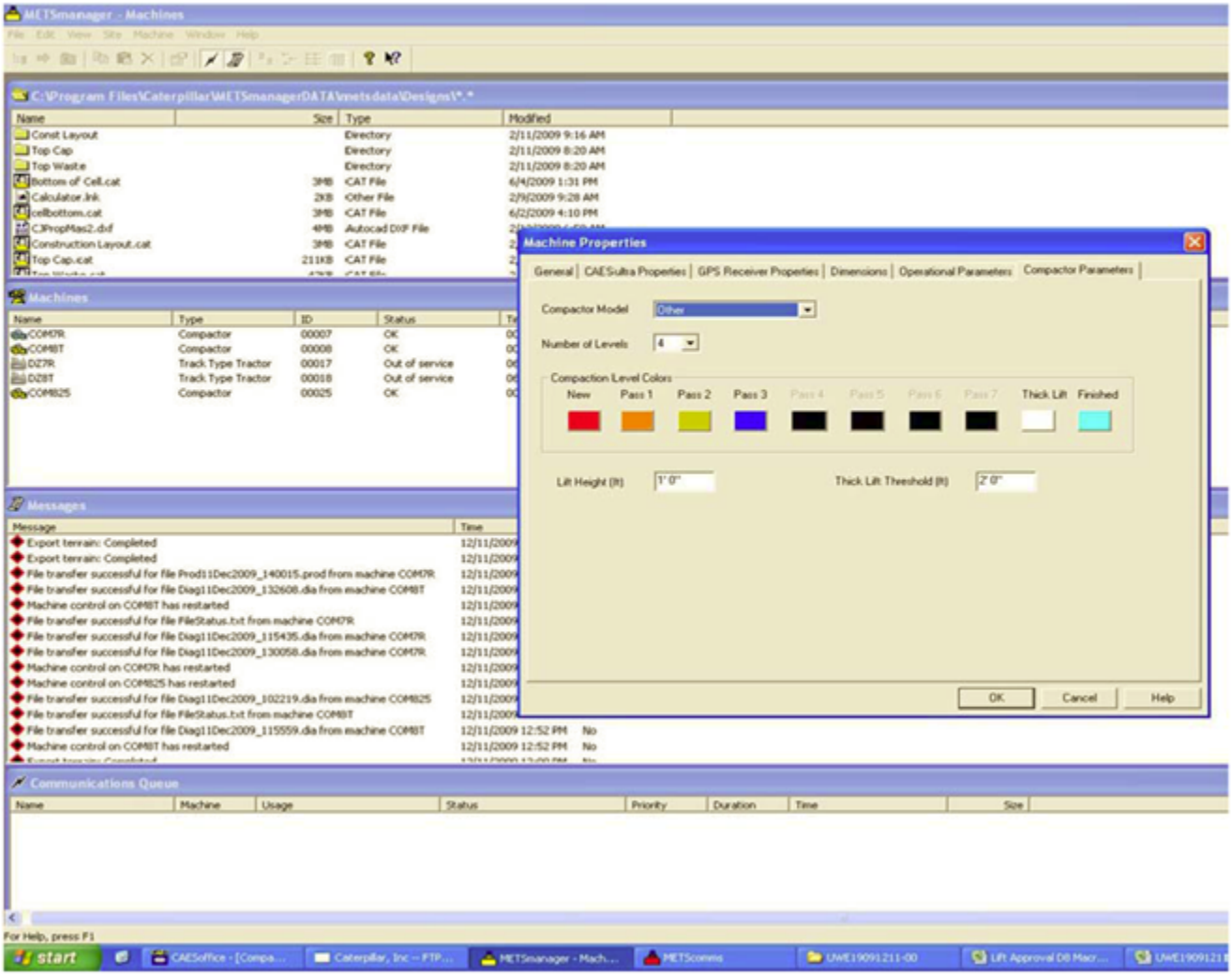
QC-F-001
File index No. 43.8.2
Page ___ of ___

Attachment 2.
24 inch lift Machine Parameters for Machines Weighing 56,669 to 84,850 lb

Attachment 2. 24-inch Lift Machine Parameters for Machines Weighing 56,669 to 84,850 lb

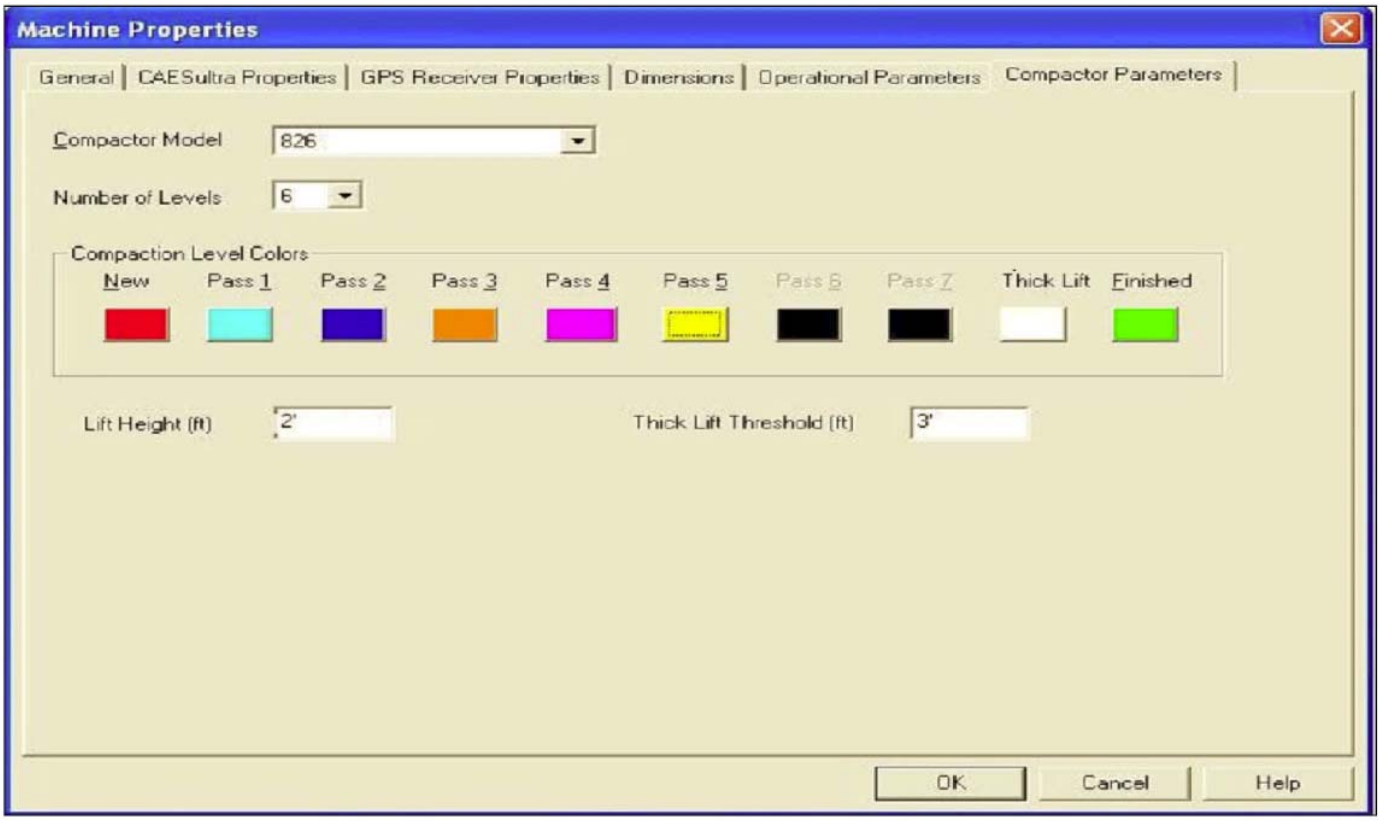


Attachment 3. 12-inch lift Machine Parameters for Machines Weighing 56,669 to 84,850 lb



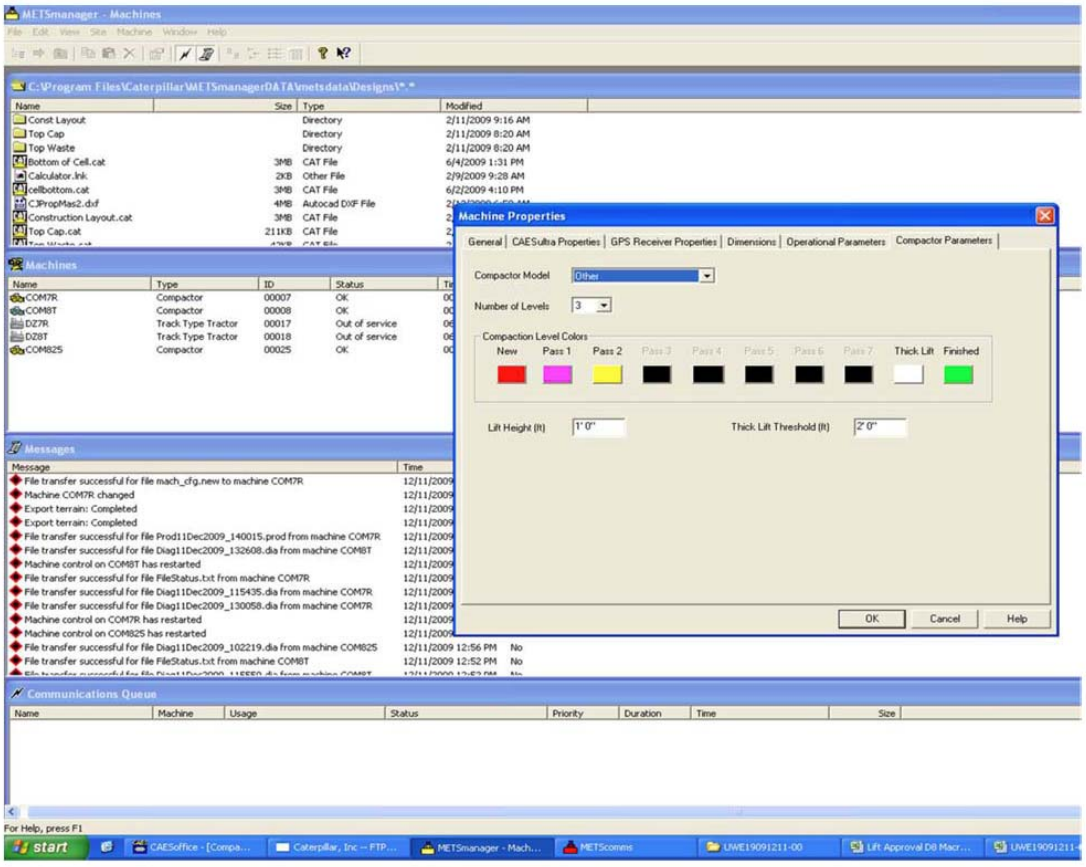
Attachment 4.
24 inch lift Machine Parameters for CAT 825H Compactors and Machines Weighing Greater Than or Equal to 84,850 lb

Attachment 4. Machine Parameters for CAT 825H Compactors and Machines Weighing Greater Than or Equal to 84,850 lb



Attachment 5.
12 inch lift Machine Parameters for CAT 825H Compactors and Machines Weighing Greater Than or Equal to 84,850 lb

Attachment 5.
Machine Parameters for CAT 825H Compactors and Machines Weighing Greater Than or Equal to 84,850 lb



Attachment 6.
Field Density Test Form (QC-F-002)

Attachment 2. Lift Approval Procedure (*continued*)

Attachment 6. Field Density Test Form (QC-F-002)

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project **OTHER** _____

LIFT IDENTIFICATION: _____ DATE: _____

TEST ID NUMBER(S): _____

TEST LOCATION: _____ TEST METHOD: _____ D1556 _____ D6938

ASTM D6938 (DENSITY DETERMINATION)

Make/Model _____ Gauge Serial # _____

Last Calibration Date: _____

Daily Standard Counts:

Density _____ Moisture _____

_____ *Method A (Direct Transmission)* or _____ *Method B (Backscatter)*

Depth Setting _____ *(inches)* Count Time _____ *(minutes)*

Moisture Count _____ Density Count _____

Wet Density (ρ_m) _____ *(lbs/ft³)* Dry Density _____ *(lbs/ft³)*

Moisture Density _____ *(lbs/ft³)* Moisture Fraction _____ *(%)*

MOISTURE DETERMINATION

_____ ASTM D2216 @ 110° C or _____ ASTM D4643

Container ID _____

Scale Serial # _____ Last Calibration Date: _____

Mass of container & wet specimen (M_{cms})		g
Mass of container & dry specimen (M_{cds})		g
Mass of water (M_w) $M_w = M_{cms} - M_{cds}$		g
Mass of container (M_c)		g
Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$		g
Moisture content (w) $w = (M_w / M_s) \times 100$		%

Dry Density $(\rho_d) = (100 \times \rho_m)/(100 + w)$

$\rho d = (\ 100 \times$ _____ $) / (100 +$ _____ $) =$ _____ *lbs/ft³*

Note: Wet Density from ASTM D 1556 (ρ_m) takes precedence over ASTM D 6938 (ρ_m)

Percent Compaction = ρ_d / $\gamma_d max \times 100$

_____ / _____ x 100 = _____ %

ASTM D1556 (DENSITY DETERMINATION)

Testing Apparatus _____ Calibrated Vol. *(lbs/ft³)* _____

Bulk Density of sand (ρ_1) _____ *g/cm³* _____ *lbs/ft³*

Mass of Sand to Fill Cone & Plate (M_2) _____ *g*

Mass of bottle & cone **before** filling cone, plate & hole		g
Mass of bottle & cone **after** filling cone, plate & hole		g
Mass of sand to fill cone, plate, & hole (M_1)		g
Mass of sand to fill hole		g
Mass of wet soil & container		g
Mass of container		g
Mass of wet soil (M_3)		g

Test Hole Volume

$V = (M_1 - M_2) / \rho_1$ _____ cm^3

Dry Mass of soil

$M_4 = 100\ M_3 / (w + 100)$ _____ g

Wet Density

$\rho_m = (M_3 / V) \times 62.43$ _____ *lbs/ft³*

Dry Density

$\rho_d = M_4 / V$ _____ *g/cm³*

Dry Unit Weight

$\gamma_d = \rho_d \times 62.43$ _____ *lbs/ft³*

Soil Description: _____

Proctor ID: _____

_____ ASTM D698 or _____ ASTM D1557

Maximum Dry Density ($\gamma_d max$) **0.0** (lbs/ft³)

Optimum Moisture (w_{opt}) **0.0** (%)

Required Moisture: **-3.0** % to **3.0** %

Required Percent Compaction: **90.0** (%)

Comments:

TEST RESULTS:

_____ Pass Date: _____

_____ Failed Moisture

_____ Failed Compaction Time: _____

By: _____ / _____

(print) *(signature)*

_____ _____

QA/QC APPROVAL DATE

Density Testing
DOE-EM/GJRAC1783

QC-F-002
File Index No. 43.8.2
Page ____ of ____

DOE–EM/GJRAC2178

Office of Environmental Management – Grand Junction

MOAB UTAH
UMTRA Project

Moab UMTRA Project
Debris Processing and Disposal Procedure

Revision 1

March 2017

U.S. Department of Energy

Office of Environmental Management

Prepared by the Remedial Action Contractor under contract number DE-DT0011049
for the U.S. Department of Energy Office of Environmental Management, Grand Junction, Colorado.

Moab UMTRA Project
Debris Processing and Disposal Procedure

Revision 1

March 2017

Prepared by the Remedial Action Contractor under contract number DE–DT0011049 for the U.S. Department of Energy Office of Environmental Management, Grand Junction, Colorado.

DOE-EM/GJRAC2178

Moab UMTRA Project
Debris Processing and Disposal Procedure

Revision 1

Review and Approval

Ken Kisiel
RAC Moab Operations/Site Manager — Date: 3/8/17

Craig Niemeyer
RAC Crescent Junction Operations/Site Manager — Date: 20MAR17

Steven D. Rima
RAC Environmental, Safety, Health, and Quality Manager — Date: 20 March '17

Greg D. Church
RAC Project Manager — Date: 3-7-17

Attachment 2. Debris Processing and Disposal Procedure (*continued*)

Revision History

Revision Number	Date	Reason for Revision
0	November 2015	Initial issue.
1	March 2017	Updated to incorporate requirements for debris placement

Attachment 2. Debris Processing and Disposal Procedure (*continued*)

Contents

Attachments

Attachment 2. Debris Processing and Disposal Procedure (*continued*)

1.0 Purpose

The purpose of this document is to describe the debris processing, inspection, handling, preparation for shipment, and placement process. This document is only intended for debris handling and does not replace existing documents designed solely for RRM handling, including the *Moab UMTRA Project Tailings Management Plan* (DOE-EM/GJRAC1891), *Moab UMTRA Project Lift Approval Procedure*, (DOE-EM/GJRAC 1803), and *Moab UMTRA RRM Weight Determination Procedure* (DOE-EM/GJRAC2098).

2.0 Background

During the excavation process, demolition debris from the former mill facilities was encountered. Debris consists of a variety of materials, including concrete, metal, piping, wood, and various components from the mill facilities. Approximately 20 percent of the demolition debris has been excavated and stockpiled from the mill tailings pile. Following excavation the demolition debris, it was segregated and stockpiled for size reduction and final disposition before transporting to the disposal cell.

3.0 Responsibilities

3.1 Moab Debris Sorting/Loading Operator

The Moab Debris Sorting/Loading Operator is responsible for:
- Understanding specifications for debris sizing.
- Performing visual inspection of debris to separate by sizing requirements.
- Loading waste containers according to requirements.

3.2 Tailings Pile Supervisor

The Tailings Pile Supervisor is responsible for:
- Understanding debris sizing and loading specifications and inspection requirements.
- Coordinating debris processing and loading.

3.3 Quality Assurance Manager

The Quality Assurance (QA) Manager is responsible for:
- Understanding debris sizing, loading, and placement specifications.
- Assisting with inspections and with process improvements.

3.4 Crescent Junction Debris Placement Operator

The Crescent Junction Debris Placement Operator is responsible for:
- Understanding debris sizing and placement specifications and inspection requirements.
- Excluding debris from lifts that do not meet size specifications and notifying QC personnel.

- Observing debris unloading and reporting issues that restrict dumping or damage equipment to supervisor.
- Working with caution when handling debris to avoid damage to tires and equipment.

3.5 Roving Crew Manager

The Roving Crew Manager is responsible for:
- Understanding debris sizing and placement specifications and inspection requirements.

3.6 Crescent Junction QC Personnel

The QC Personnel at the Crescent Junction site are responsible for:
- Understanding he debris sizing and placement specifications and inspection requirements.
- Inspecting and approving debris lifts in accordance with Project requirements and documenting debris lifts on the Debris Lift Approval Form (QC-F-013) (see Attachment 1).

3.7 Crescent Junction Operations/Site Manager

The Crescent Junction Operations/Site Manager is responsible for:
- Understanding debris sizing and placement specifications and inspection requirements.
- Scheduling debris shipment, placement, and inspections.
- Assisting with process improvement.

4.0 Specification for Placement and Sizing of Debris

The applicable section of the *Moab UMTRA Project Remedial Action Plan* (DOE-EM/GJ1547), Addendum B, Section 31 00 20, Item 3.2.5, lists the requirements for sizing and placement of debris and is quoted below.

> *3.2.5 Placement of Demolition Debris*
> *Demolition debris will be placed in the waste cell along with RRM material. Demolition debris will be sized by others, off site before being placed in containers and hauled to the Crescent Junction disposal cell. Demolition debris is to be sized as follows:*
> - *Wood, Concrete, Masonry: Cut or break up to a maximum 3-foot size measured in any dimension.*
> - *Structural Steel Member, Pipes, Ducts, Other Long Items: Cut into maximum 10-foot lengths.*
> - *Concrete, Clay Tile, and Other Pipes: Crush concrete and clay tile pipes. Crush other pipes and ducts that are 6 inches or greater in diameter or, if crushing is impractical, cut pipes and ducts in half longitudinally. Do not crush asbestos-cement pipe.*
> - *Rubber Tires Excavated at the Site: Cut into two halves around the circumference.*
> - *Geomembranes and Other Sheet Material: Cut into strips a maximum of 4 feet wide by 4 feet long.*
> - *Tree limbs 4 inches in Diameter and Larger: Cut into lengths of 8 feet or less.*
>
> *The contractor may perform additional size reduction, as necessary. The above information is provided to inform the contractor of material sizes to be delivered for disposal. The contractor is responsible for placement of demolition debris in the waste disposal cell and compaction of RRM around the placed debris. Demolition debris shall be placed in a manner that results in a minimum of voids around the debris. The ratio of debris to RRM shall not exceed 50/50 by volume in each lift.*

The applicable section of the *Remedial Action Plan*, Addendum E, "Remedial Action Inspection Plan" (RAIP), Section 6.4.4 lists the requirements for inspection of the sizing and placement of debris and is quoted below.

> *6.4.4. Demolition Debris*
> *Demolition debris will be placed in the waste cell along with RRM. Demolition debris shall be placed in a manner that results in a minimum of voids around the debris. The ratio of debris to RRM shall not exceed 50/50 by volume in each lift. The following materials will be placed in the waste cell:*
> - *Wood, Concrete, Masonry: Cut or break up to a maximum 3-foot size measured in any dimension.*
> - *Structural Steel Member, Pipes, Ducts, Other Long Items: Cut into maximum 10-foot lengths.*
> - *Concrete, Clay Tile, and Other Pipes: Crush concrete and clay tile pipes. Crush other pipes and ducts that are 6 inches or greater in diameter or, if crushing is impractical, cut pipes and ducts in half longitudinally. Do not crush asbestos-cement pipe.*
> - *Rubber Tires Excavated at the Site: Cut into two halves around the circumference.*
> - *Geomembranes and other Sheet Material: Cut into strips a maximum of 4 feet wide by 4 feet long.*
> - *Tree limbs 4 inches in Diameter and Larger: Cut into lengths of 8 feet or less.*

5.0 Moab Debris Operations

5.1 Debris Processing/Size Reduction

The bulk of the debris processing and size reduction will be accomplished with an excavator equipped with the appropriate attachment, (e.g., processor, hydraulic hammer or shear), and work will be conducted in accordance with IWP/JSA 017, Debris Removal Processing. Efforts will be made to ensure debris, including concrete, metal and mixed debris, is size-reduced to meet the disposal requirements and to avoid potential container damage during the loading, transportation, and unloading processes.

During size reduction operations, debris will be physically separated by the operator to remove any oversized or non-compliant material, leaving only material/debris that meet the disposal specification. Oversized and non-compliant material will be segregated for further processing or special consideration and approval for final disposition before loading and shipment.

5.2 Loading Debris

All debris types will be loaded into designated containers or over-the-road haul trucks. Containers loaded with debris will be identified and recorded to ensure proper handling at the disposal facility. To protect the bottom of the container/truck bed and facilitate the unloading process at the disposal cell, a layer of tailings may be placed in the bottom of the container before loading debris. When loading containers with debris, efforts will be made to ensure no debris that may cause potential damage when the lid is placed protrudes from the container

5.3 Moab QC Activities (Inspection)

QC personnel shall inspect debris at the Moab site, identifying items that do not meet disposal requirements or have internal voids. These items shall be segregated for further size reduction or future disposition.

5.4 Weight Tracking and Other Information

Each container loaded with debris material will be individually weighed, and the weight recorded in accordance with the *Moab UMTRA RRM Weight Determination Procedure* (DOE-EM/GJRAC2098). No effort will be made to track the percentage of debris in each container.

6.0 Crescent Junction Operation

6.1 Unloading Debris Containers

Debris containers will be unloaded at the dump ramp. Debris unloaded from over-the-road trucks may take place at the dump ramp or at a designated location established for debris. The location for unloading trucked debris will be determined on case-by-case basis, considering multiple factors including debris type, size, configuration, truck type, site conditions, and placement location. Following the unloading process, debris will be loaded into on-site trucks and transported to the active lift placement area. The operators should use caution not to run over debris that could damage heavy equipment tires.

6.2 Debris Placement - General

Debris, including concrete, metal and mixed debris, will be mixed with RRM and incorporated into a maximum of a 24-inch loose lift. Once dumped at Crescent Junction debris will be placed and spread out in accordance with the RAIP. Debris shall be spread into layers not greater than 24 inches thick and not greater than 50 percent debris and 50 percent RRM ratio.

Efforts shall be employed to reduce voids and prevent nesting when placing debris in the disposal cell. Potential differential settlement from compression can be eliminated by preventing the inclusion of cavities during the waste placement process. If voids are visually present between debris items in the lift after the spreading process, debris will be re-worked to remove visible voids.

Efforts shall be made to place debris in the lower lifts of the cell. Debris shall be disposed within 20 feet of the cell floor. No debris placement shall take place within 10 feet of the cell embankment or within a 25 feet radius of a stand pipe.

6.3 Debris Placement – Large Single Item

Single debris items (e.g., concrete, wood, masonry objects) thicker than 24 inches are allowed. The objects must not exceed 3 feet in any dimension and must be placed in a manner that allows compaction around the debris item in all directions.

Alternatively, narrower compactors and hand compaction methods can be used to accomplish compaction around the objects. When objects larger than the size requirement outlined in the specification are encountered, and it is determined that these objects cannot be safely size reduced, specific plans or modifications to this procedure will be developed to safely handle these objects. These objects may only be placed in the cell for disposal following receipt of approval from the Nuclear Regulatory Commission.

6.4 Verification Activities (Inspection)

The verification of debris placement requirements relies heavily on observation during actual placement by equipment operators and oversight by QC personnel. Quantifiable compaction testing methods have proven unreliable when placing debris due to the variable density and configuration of the debris being placed. When placing debris lifts QC personnel shall perform a visual inspection (see Moab Debris Placement Memo in Attachment 2). Visual inspections performed shall ensure the lift is uniformly placed in a manner that minimizes voids, verify debris size, and verify overall lift thickness. The results of the visual inspection shall be recorded on the Debris Lift Approval Form (Attachment 1). Photos may also be taken to further document the lift placement.

7.0 QA Review

The QA Manager or designee shall review the debris records before submitting to Records Management.

8.0 Records

All documentation created as a result of compliance with this procedure is considered a Project record and will be managed in accordance with the *Moab UMTRA Project Records Management Manual* (DOE-EM/GJ1545), which follows DOE orders, policies, and regulations for retention and maintenance of records.

9.0 References

DOE (U.S. Department of Energy) *Moab UMTRA Project Records Management Manual* (DOE-EM/GJ1545).

DOE(U.S. Department of Energy) *Moab UMTRA Project Lift Approval Procedure* (DOE-EM/GJRAC1803)

DOE (U.S. Department of Energy) *Moab UMTRA Project Remedial Action Plan* (DOE-EM/GJ1547).

DOE (U.S. Department of Energy) *Moab UMTRA RRM Weight Determination Procedure* (DOE-EM/GJRAC2098).

DOE (U.S. Department of Energy) *Moab UMTRA Project Tailings Management Plan* (DOE-EM/GJRAC1891).

Attachment 1.
Debris Lift Approval Form QC-F-013

Attachment 2. Debris Processing and Disposal Procedure (*continued*)

Attachment 1. Debris Lift Approval Form QC-F-013

DEBRIS LIFT APPROVAL FORM

PROJECT: _____ OTHER _____

NW CORNER DATE: _____

P_1			
EW:	X		=
NS:	X		=
P_2			
EW:	X		=
NS:	X		=
P_3			
EW:	X		=
NS:	X		=
P_4			
EW:	X		=
NS:	X		=
P_5			
EW:	X		=
NS:	X		=

Page 2 attached: Y N

IDENTIFY LOTS ABOVE

LIFT ID: _____ - NW CORNER: _____

Uncompacted Thickness: _____ Compacted Thickness: _____ Debris Insp. By: _____ Date: _____ Time: _____

NW CORNER of debris placement: _____ EW Dimension _____ NS Dimension _____

Lift Area (ft²): _____ Lift Volume (yd³): _____

Comments:

KEYING IN NOTES: N E S W _____

LIFT APPROVED BY _____ DATE: _____ TIME: _____

_____ _____

QA/QC APPROVAL DATE

Attachment 2.
Moab Debris Placement Memo

Attachment 2. Moab Debris Placement Memo

PORTAGE

Memo

To: Greg Church, RAC Project Manager

From: Ray Schwaller, RAC Project Engineer

CC: Ken Kisiel, Moab Operations Manager
Craig Niemeyer, CJ Operations Manager
Kathy Turvy, Project QA Manager

Date: 2/14/2017

Re: Moab UMTRA Project, Debris Placement Quality Control

This memorandum provides a review of the mixed waste and debris placement procedures and recommends quality control (QC) practices for lift acceptance.

The most common waste, residual radioactive material (RRM), typically consists of soil ranging from clay to sand and is placed and compacted in the repository using conventional earthwork practices. It is placed in 12-inch lifts and compacted to a minimum of 90% of maximum dry density per the standard Proctor test (ASTM D698). The intent is to minimize voids during waste placements, and ultimately reduce settlement in the waste fill.

To accommodate debris waste, the U.S. Department of Energy (DOE) proposed to modify the maximum lift thickness from 12 inches to 24 inches, and received concurrence from the U.S. Nuclear Regulatory Commission (NRC) to proceed. Along with this, it is a requirement to place the debris with at least 50% RRM so that the space between debris components is adequately filled.

Handling and placement of the debris are accomplished as described in the Debris Processing and Disposal Procedure (Document # DOE-EM/GJRAC2178).

There are two test methods used to evaluate density for the placed and compacted RRM waste. Those include direct measurements using a nuclear density gauge (with periodic checks by the sand cone method) and the Computer-Aided Earthmoving System (CAES). The CAES has been calibrated for the various types of equipment and is used to assure the minimum number of passes are completed to achieve the required densities.

These test methods are problematic with the mixed RRM and debris waste. To check compaction with the nuclear density gauge, a hole is punched into the material being tested and the source probe is extended down the hole. The test hole cannot be advanced into debris (i.e., concrete rubble or steel components). If the test hole is unknowingly placed between debris, then the test results will be skewed by the dense debris components, yielding a false high reading. Compression of the lift is difficult to measure with the CAES, because compacting the heterogeneous mix results in a non-uniform surface.

Based on these considerations, recommended QC for debris placement includes observation by QC personnel to assure the proper processing and disposal procedures are being followed. If a problem is observed during the disposal process, the onsite QC person should notify the equipment operator immediately to take appropriate action and correct the concern. Lift acceptance as documented by the QC person provides confirmation that the required procedures were followed and corrective actions were taken as appropriate.

Ray Schwaller
2/14/2017